Using composted grape marc in the vineyard

The AWRI helpdesk recently received a query from a grower who had applied composted grape marc at a rate of 70 cubic metres per hectare to their vineyard, but had some concerns as to whether this application would have an effect on fruit quality. The marc used had been composted for six years. This column explores some of the possible benefits and risks of using composted marc in vineyards.

What are the benefits of applying mulches, composts or manures to vineyards?

Mulches, composts or manures are generally applied to vineyards to improve vine growth, fruit quality and yield. Impacts on soil can include increased organic matter content, increased microbial activity, improved water infiltration and water-holding capacity, reduced soil temperature and reduced evaporation. It is important to recognise that these soil inputs vary in composition and their make-up should be known before they are used. Characteristics that should be considered include nutrient levels, pH, carbon-to-nitrogen ratio, electrical conductivity and heavy metal content. This information should then be assessed against the condition of the soil that is being treated and the crop's requirements so that the likely consequences of making the addition can be determined.

What are the general compositional characteristics of composted grape marc?

A common characteristic of composted grape marc is that it contains potassium (K) in the range of 2-3% w/w. The high K content is due to K accumulation in the grape skins. If a rate of around 50 tonnes of composted grape marc per hectare is applied (where 1 cubic metre weighs around 700kg), based on 2% w/w, about one tonne of K is applied per hectare. A vineyard's annual requirement for K has been estimated to be around 50-100kg per hectare (Robinson 2001), so this is significantly more than the vines need.

What are the possible impacts of excessive potassium application?

Excessive K fertilisation has the potential to increase the K concentration and pH of grape must, which could have negative consequences for wine quality, given that high pH wines require larger acid additions, and are more susceptible to oxidative and microbial spoilage. The colour stability of red wine is also decreased at higher pH.

Analysis of K levels in red and white wine shows median levels around 1100ppm and 600ppm, respectively (Wilkes and Wheal 2018). As K is accumulated in the skins of grapes, during the red winemaking process there is greater opportunity for extraction into the final wine than in white winemaking where skin contact is limited. If high-K compost is applied to white grape varieties, the impact on winemaking is therefore reduced, but there are other issues to consider.

In soils with high available K, there is also a risk that magnesium (Mg) deficiency can be induced. In circumstances where K ions outnumber Mg ions, roots will passively take up more K, resulting in a possible Mg deficiency.

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It should be noted that it is difficult to predict what the outcome of a large K dose is likely to be. Mpelasoka *et al.* (2003) identified there are many factors and complex interactions that may affect the accumulation of K by berries. Research trials show mixed results in terms of K uptake into the vine. In two studies designed to trigger a K response that could be measured in grapes and wine, the results were muted. Mundy and Agnew (2002) tested very large applications of grape marc on two soil types in New Zealand and while the soil K value increased by 400%, the impact on juice K and pH was relatively minor. Similarly, when Capello (2013) applied a range of soil inputs including grape marc compost containing about 1 tonne of K per hectare, the impacts on berry pH, berry anthocyanin levels and wine K levels were not appreciably different from the control.

Is there anything that can be done to influence K accumulation in berries or to manage it in the winery?

In the vineyard, management of canopy density can influence berry K accumulation. The degree of shading of the canopy has been shown to be important, with increased K in vines, berries and juice associated with dense canopies. Canopy density can be reduced by shoot trimming, selective shoot removal, leaf removal and through training and trellising that spreads the shoots over a wider area. A vine's access to water and nitrogen can affect vigour,

so these inputs should be managed with care. Practices to dry out the soil at key growth stages to trigger the cessation of shoot growth (such as withholding water or allowing undervine cover crops) could also be applied.

In the winery, acid adjustment to correct the pH is the common solution. Managing high K levels and acidity in the winery will be addressed in the next 'Ask the AWRI' column.

References and further reading

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Composted grape marc characteristically has a high potassium content due to the level of potassium in grape skins. If applied to a vineyard at a rate of 50 tonnes per hectare, this would result in about 1 tonne of potassium applied to each hectare of vines which is significantly more than they need given a vineyard's annual requirement for potassium has been estimated to be around 50 to 100kg per hectare.

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